

14. POLYMERS FOR ELECTRONIC PACKAGING

Course Leader: Jeffrey Gotro –InnoCentrix, LLC

Course Objective:

The course will provide a broad overview of polymers used in semiconductor packaging and the important structure-property-process-performance relationships. We will cover in more depth the chemistries, material properties, and process considerations for adhesives, underfills, coatings and mold compounds. Additionally, we will provide an introduction to common thermal analysis methods (DSC, DMA, TMA, and TGA) used to characterize thermosetting polymers used in semiconductor packaging. Finally, the course will provide an introduction to the rheological performance of polymer-based materials used in packaging semiconductors. In most cases, adhesives, underfills, mold compounds and coatings are applied as a viscous liquid and then cured. The flow properties of these materials are critical to performance in high volume manufacturing. The course will provide an introduction to rheology measurements and examples of rheology issues in semiconductor packaging.

Course Outline:

1. Thermosetting Polymers Versus Thermoplastics
2. Temperature Dependence of Physical Properties
3. Thermosetting Polymers: Curing, Curing Mechanisms, Network Formation
4. Overview of Key Chemistries Used: Epoxies, Acrylates, Polyimides, Timaliids
5. Chemistry of Die Attach Adhesives: Paste, Film and Wafer Applied
6. Chemistry and Physics of Capillary Underfills, Pre-Applied Underfills, Wafer Level Underfills
7. Polymers used in Wafer Level Packaging, awl, and Other Fan-Out Packages
8. Packaging Substrate Materials and Process
9. Encapsulants (Mold Compounds) and Coatings
10. Introduction to Rheological Characterization Methods: Types of Rheometers and Basic Techniques
11. Introduction to the Rheological Properties of Adhesives
12. Key Rheology Properties: Shear Thinning, Viscosity, Rheology Changes during Curing

Who Should Attend:

Packaging engineers involved in the development, production, and reliability testing of semiconductor packages would benefit from the course. R&D professionals interested in gaining a basic understanding of the structure/property/process/performance relationships in polymers and polymer-based materials used in electronic packaging will also find this course valuable.

Bio:

Dr. Jeff Gotro has over thirty years' experience in polymers for electronic applications and composites having held scientific and leadership positions at IBM, AlliedSignal, Honeywell, and Ablestik Laboratories. He has published 60 technical papers (including 4 book chapters) in the field of polymeric materials for advanced electronic packaging applications, holds 15 issued US patents, and has 4 patents pending. Jeff is an expert in thermosetting polymers and he has received invitations to speak at prestigious Gordon Research Conferences (Thermosetting Polymers and Composites). He has presented numerous invited lectures and short courses at national technical conferences. Jeff was an Adjunct Professor at Syracuse University in the Dept. of Chemical Engineering and Materials Science from 1986-1993 and has taught courses on Innovation in the MBA program at Concordia University in Irvine, CA. Jeff is a member of the

American Chemical Society (ACS), the Institute for Management Consultants (IMC), IEEE Advanced Packaging Society, the International Microelectronics and Packaging Society (IMAPS), and the Society of Plastics Engineers. Jeff has a Ph.D. in Materials Science from Northwestern University with a specialty in polymer science and a B.S. in Mechanical Engineering/Materials Science from Marquette University.